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SUPPLYING WATER TABLE INTAKE THROUGH AGRICULTURAL USE OF URBAN --ETC(U)
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SUPPLYING WATER TABLE INTAKE THROUGH AGRICULTURAL USE OF URBAN SEWAGE

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The natural conditions for using the enrichment of ground water described were particularly valuable in this report. It would also be possible to make reasonable agricultural use of ground irrigated by sewage water without very great difficulty. According to the conclusions of the work described here, two basic advantages were obtained: 1) The levels of the water table and surface waters in the vicinity of the waterworks intakes rise considerably, and 2) Land with an area of 620 ha, largely fallow, was transformed into fruitful

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meadows, pastures and arable land.

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SUPPLYING WATER TABLE INTAKE THROUGH THE AGRICULTURAL USE OF URBAN SEWAGE

(Zasilanie juec wodociagowych przez wykorzystanie rolnicze sciekow miejskich)

By Jan Wierzbicki

(Institute of Land Improvement in Green Lands, TOB, Wroclaw), pp. 17 - 18

SUPPLYING WATER TABLE INTAKE THROUGH THE AGRICULTURAL USE OF URBAN SEWAGE

By Jan Wierzbicki

An insufficient ground water intake capacity makes it necessary to supplement supplies of this water with other sources, e.g., underground dams, shoreline filtration, drain wells, etc. However, these sources are not always able to provide a sufficient amount of water, and produce completely unsatisfactory results in areas which are poor in ground and surface water. When it is necessary to take in a larger amount of ground water in areas with poor water tables, a sufficient intake capacity can only be provided by bringing in water from outside sources and infiltrating it. If the influx of warm water is to be sufficiently abundant and steady, without regards to the weather conditions of a given year, the intake of indispensable quantities of artificial ground water will be reliable. Urban sewage water meets these conditions in terms of quantity; qualitatively it must be purified to a degree guaranteeing that this water is completely suitable for consumer and industrial purposes.

Percolation of sewage through the ground can guarantee such a high degree of purity, under the condition of a low load of 60 - 70 mm monthly (maximum 800 mm annually), with the use of as little treatment as possible, e.g., 30 - 35 mm at a slow spray rate and with a break of a dozen days or so in the irrigation.

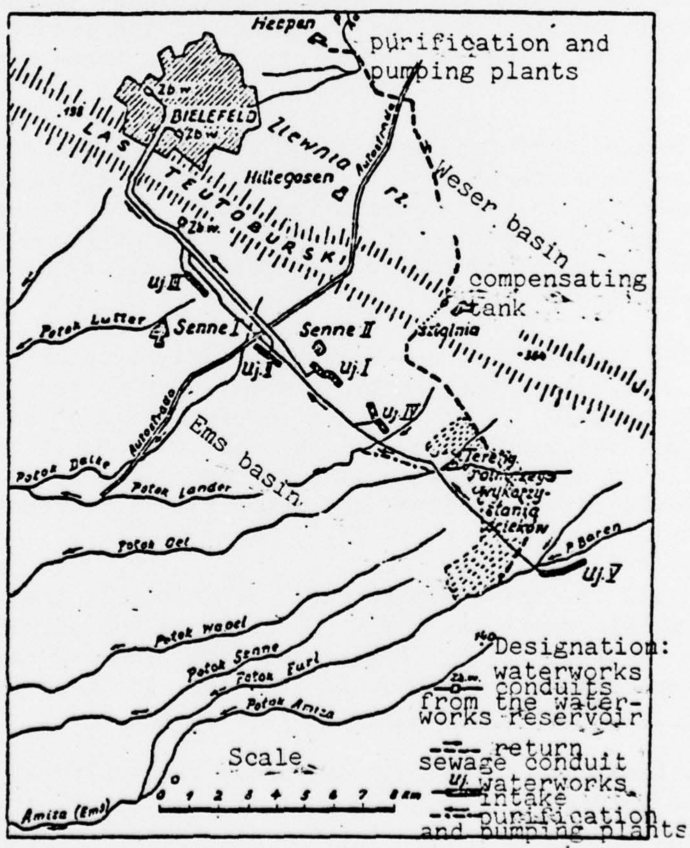

Figure 2. Waterworks in Bielefeld and the supply of these intakes with treated sewage water.

Sewage water percolating through the soil is subject to mechanical, physico-chemical and biological sorption, and its organic impurities are mineralized. Vegetation easily accepts the nutritional components and substantial amounts of water when purified sewage covers the transpiration loss. This water, along with rain water, provides ground water. In all cases the water table rises considerably in land irrigated with sewage water. For example, in Delitzsch-Schenbenburg near Leipzig the level of the water table rose by 22.2 m, and instead of 5.50 m came to about 3.30 m* as early as the eighth year of irrigation by sewage on agricultural land.

The potential of significantly raising the water table by using urban sewage for irrigating farm crops was used in the Bielefeld waterworks.

Bielefeld, a city of 170,000 inhabitants, located on the northern slope of the Teupoburg Forest in the Weser basin, has been making use of water intake from the area of the Ems basin since 1890. Some significant amounts of very good quality water come from sand lying at the southwestern foot of the Teupoburg Forest. This water requires no treatment to make it suitable for drinking. However, after just a few years of using the water supply facilities, the output of intake I, supplying 1 million m^3 of water annually, proved insufficient and more intakes were built: II, III and IV, which supplied 7 million m^3 of water in 1952 together with intake I. At the same level of the water table and the water level in streams flowing through the area of these intakes (Figure 1) began to drop alarmingly. Additionally, the adverse effect of the reduction in ground water became more and more evident from year to year in forests and agricultural lands.

However, more hundreds of thousands m^3 of water were needed for developing industry and the growing population of Bielefeld. In 1952 it was decided to construct a new intake on the Baren stream (intake V). The water authorities gave permission for the construction of this intake under the condition that water taken from the Ems be piped to its basin, and water transferred to Bielefeld be piped to the Weser basin.

It was necessary to construct an expensive pipeline so as to move the sewage that was initially purified in the treatment plant near Heepen, to the compensating tank in Oerlinghausen, located on the northern edge of the Teupoborg Forest. Then a tunnel and pipeline had to be built to conduct the sewage by gravity to the irrigated 620 ha fields. The conduits were 23 km long and the total cost of the equipment to "return" the water to the Ems basin came to 8.6 million German marks.

After the work was finished, 5 million m^3 of initially treated sewage were pumped annually from 1954 on to the basin of the Senne and neighboring streams, and the sewage that was sprayed and flooded over the land was used on plowed fields, especially on meadows and pastures. The soil in these fields was thick

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*Schroeder, G. Landwirtschaftlicher Wasserbau (Agricultural Water Structure), Berlin, 1950, Second Edition.

diluvial sand, often completely stale, up to 20 - 25 km deep. The filtration rate averages 1 m/d, with a drop in so-called ground water (the water table) of about 1%.

After sewage use began, the land intended for irrigated fields was mainly covered with poor vegetation, heather and sparsely growths of pines with small annual increments. This land was transformed into good meadows and pastures after being irrigated with sewage water. The water level in the streams adjacent to the waterwork intake rose and after 1956 no impurities, indicating a water quality deterioration in comparison with the past were found in the biocenosis of these streams. These streams continue to carry pure water.

The natural conditions for using the enrichment of ground water described were particularly valuable in this case. It would also be possible to make reasonable agricultural use of ground irrigated by sewage water without very great difficulty.

Thanks to the conclusions of the work described above, two basic advantages were obtained:

1. The levels of the water table and surface waters in the vicinity of the waterworks intakes rise considerably, and

2. land with an area of 620 ha, largely fallow, was transformed into fruitful meadows, pastures and arable land.

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